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14. ABSTRACT
The major research goal for 2008 was to publish an analysis of the relative importance of diapycnal and isopycnal mixing on the Oregon Shelf and study the role of internal waves in this environment

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Lateral Mixing

Eric A. D'Asaro
APL/UW 1013 NE 40th Str, Seattle, WA 98105
phone: (206) 685-2982 fax: (206) 543-6785 email: dasaro@apl.washington.edu

Award Number: N00014-08-1-0974
http://opd.apl.washington.edu/~dasaro/HOME/

LONG-TERM GOALS

I seek to understand the processes controlling lateral mixing in the ocean, particularly at the submesoscale, i.e. 100m-20km.

OBJECTIVES

The major research goal for 2008 was to publish an analysis of the relative importance of diapycnal and isopycnal mixing on the Oregon Shelf and study the role of internal waves in this environment.

The major administrative goal for 2008 was to work with others to develop a plan for the Scalable Lateral Mixing DRI.

APPROACH

Neutrally buoyant Lagrangian floats were deployed on the Oregon Shelf during the summers of 2000 and 2001. The float motion measures the rate of change of water properties along parcel trajectories High frequency measurements along the float trajectory were used to infer diapycnal mixing rates. The comparison of the observed rate of change and that inferred from diapycnal processes alone allows the role of isopycnal processes to be inferred.

Specifically, an equation for the rate of change of 'spice', Π, a passive scalar roughly orthogonal to potential density in θ/S space, can be derived roughly following McDougall (1984): $\Pi_t = D\Pi_{\sigma\sigma}\sigma_d^2$, where D is the diapycnal diffusivity, σ is potential density, and the subscripts σ and d imply differentiation with respect to potential density and depth respectively. The diapycnal diffusivity is evaluated from the spectrum of potential density near N following D'Asaro and Lien (2007) and the other quantities from the float CTD measurements. This analysis was applied to a single float from the 2001 Oregon Shelf float deployments.

A DRI planning meeting was held in May 2008 at MIT.

WORK COMPLETED

The results of the mixing analysis have been published in the Limnology and Oceanography special issue on Autonomous and Lagrangian Science.

A draft plan for the DRI was developed including two potential measurement programs and a mechanism for deciding on experimental sites.

RESULTS

Diapycnal mixing is found to mostly predict the observed changes at the float, with some notable periods where isopycnal mixing must also be important. Thus both can be important at the measured scales of many meters and a few days. A similar analysis conducted for chlorophyll instead of spice, shows that diapycnal mixing does not explain the observed variations. Instead, isopycnal mixing, planktonic sinking or possibly growth is important.

REFERENCES

D'Asaro, Eric, Ren-Chieh Lien, 2007, Measurement of Scalar variance dissipation from Lagrangian floats, , *J. Atmos. & Oceanic Tech*., 24, 1066-1077

McDougall, T.J. 1984. The relative roles of diapycnal and isopycnal mixing on subsurface water mass conversion. *J. Phys. Oceanogr*. **14**: 1577–1589.

PUBLICATIONS

D'Asaro, Eric A. 2008. A diapycnal mixing budget on the Oregon shelf. *Limnol. Oceanogr*. 53: 2137-2150